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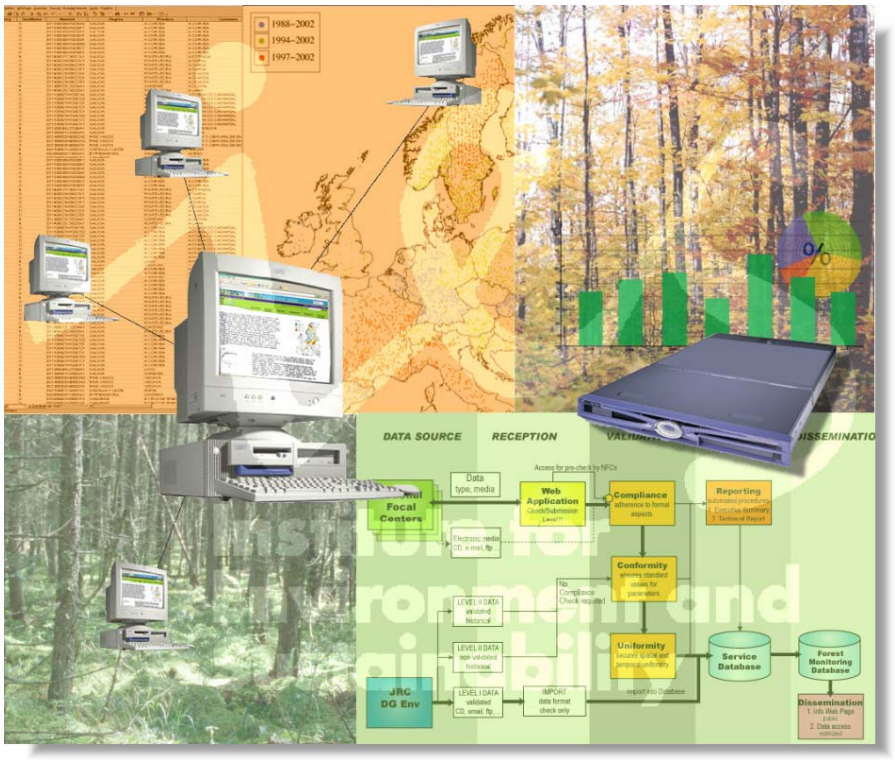
Forest Focus Monitoring Database System

EXECUTIVE SUMMARY REPORT 2004 LEVEL II DATA

Hiederer. R. T. Durrant, O. Granke, M. Lambotte, M. Lorenz. B. Mignon



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Forest Focus Monitoring Database System

EXECUTIVE SUMMARY REPORT 2004 LEVEL II DATA

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1 GENERAL INFORMATION

This *Executive Summary Report* for 2004 Level II data supplements the *Technical Report* for the same monitoring year. It presents a concise account of the data submitted and the results obtained from validating the data. Problems encountered with a general character and particularities with significant consequence on the overall project are also included in the report. For details and technical background of the data and the validation process the *2004 Technical Report* should be referred to.

1.1 Background

Forest Focus (Regulation (EC) No 2152/2003[1]) is a Community scheme for harmonised, broad-based, comprehensive and long-term monitoring of European forest ecosystems. The monitoring programme of air pollution effects is linked to International Cooperative Programme on Assessment and Monitoring of Air Pollution Effects on Forest (ICP Forests). ICP Forests reports to the working Group on Effects of the Convention of the Long-Range Trans-boundary Air Pollution (CLRTAP) of the United Nations Economic Commission for Europe (UN-ECE).

Countries participating in the scheme designate authorities and agencies as National Focal Centres (NFCs) submit annually to DG Joint Research Centre of the European Commission their observations made on the network of observation plots for intensive and continuous monitoring (Level II). For managing the data DG JRC has implemented a Forest Focus Monitoring Database System. The system was developed and implemented under contract by a Consortium, coordinated by I-MAGE Consult with Nouvelles Solutions Informatiques s.a. (NSI) as consortium partner and the Bundesforschungsanstalt für Forst- und Holzwirtschaft (BFH) as sub-contractor.

1.2 Reporting

The objective of the reporting task is to provide a comprehensive account on the data provided for a given monitoring year in form of standardized documents. The main documents produced are the *Data Submission Report, Technical Reports* and the *Executive Summary Report*.

[1] OJ L 324, 11.12.2003, p. 1-8

- *Data Submission Reports* present a detailed account of data submitted by NFCs to the Commission and includes the results from the compliance checks, which are generated during the process.
- *Technical Reports* contain results and findings obtained from all data validation checks for a given monitoring year. Observations reported for a given monitoring year are contrasted with those from previous years. Developments ove time and differences between plots are investigated. Any specific areas of concern are described explicitly. Where appropriate measures to improve the data submission and their compliancy are proposed.

- The *Executive Summary Report* is published as a complement to the *Technical Report*. It combines a summary on data submission and results from the validation process. Specific attention is drawn to any problem found during data submission and peculiarities of the year are highlighted.

These reports are prepared separately for each monitoring year following the schedule for data submissions and the validation process.

2 DATA VALIDATION PROCESS

The validation of data submitted by NFCs forms the central activity of data processing and management. Its purpose is to ensure that the information stored in the system is transparent to any user and that it can be used in the evaluation of temporal and spatial trends. It should also allow the integration of the data with other data sources in more extensive thematic analyses. During validation the data are subjected to various checking routines. The routines are applied in succession with increasing degree of complexity of the checks performed. A graphical overview of the validation tests is given in Figure 1.

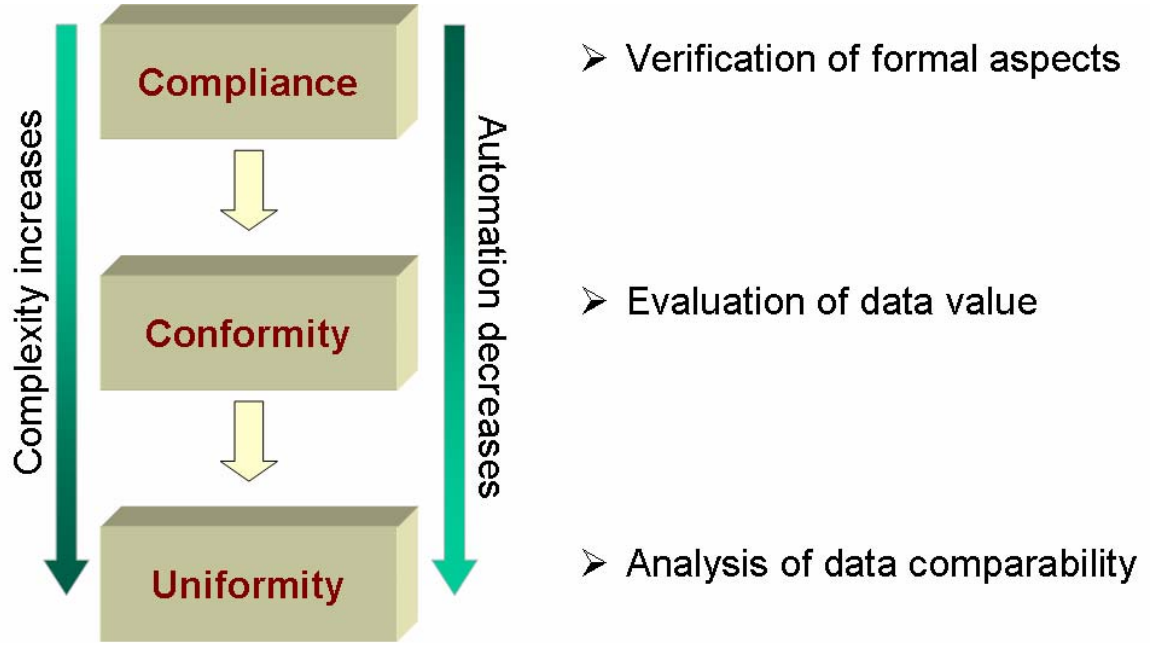

Figure 1: Sequential arrangement of Data Validation Tests

The validation process is based on the principle of evaluating the probability that a data value comprises an actual observation. It excludes values, which are impossible values, e.g. pH = 0, and marks those, which are unlikely to be investigated further. In addition, data consistency is tested by checking the constancy of static values (e.g. individual tree species, altitude) from year to year and logical continuity of the change of data collected (e.g. tree diameter, age).

2.1 Validation Checks

Data are validated based on the principle that it is not possible to identify the correctness of data, but rather that it is possible to identify the probability that data represent valid measurements or conditions. The methodology applied is a sequential grading of data using various characteristics and increasingly complex tests.

2.1.1 Compliance Check

The tests applied for the Compliance Check verify if the submitted data comply with the formats stipulated in the data submission forms. The submission file format is based on the *Technical Specifications* documents issued by DG JRC for each monitoring year. Also validated is if the values are admissible, e.g. in case of categorical parameters. Any deviation from the defined format will lead to an error or at least a warning message. In case a value fails a compliance test the whole survey cannot be further processed and an NFC will have to submit the survey with corrected values.

2.1.2 Conformity Check

The Conformity Check comprises a number of subtasks that are made after the submitted data have been subjected to compliance checks and have been loaded to the staging area of the processing database. The data are tested for

- being plausible either within expected general ranges (single parameter),
- depending on values of other parameters (multiple parameter), or
- depending on the values from former years (time series).

At this stage data from other plots are only considered as far as the integrity of the database is concerned. The validity of a parameter is tested without taking other plots into account.

2.1.3 Uniformity Check

Uniformity is validated by testing the stability of a parameter as compared to data observed at neighbouring plots. Uniformity tests are more qualitative and constitute a first step into data evaluation. In contrast to compliance and conformity tests the method applied to check the uniformity tests is implemented as a semi-automated procedure. While tables and maps are produced automatically experts interpret the results and put the findings into a general context. The interpretation includes a comparison with external data as far as available.

2.2 Validation Reports and Feedback from NFCs

The tests of the Compliance Check are performed on-line at the time of data submission. A report on the status of the data is generated instantly when testing the data before submitting the forms. Conformity and Uniformity checks are more complex and time-consuming and have to be performed off-line. NFCs receive by e-mail an automatically generated detailed report on the processing status containing any warnings and errors encountered. The communication to NFCs also contains a request for data correction(s) and/or confirmation(s).

The NFC had the opportunity to react in different ways:

- extreme values are confirmed by the NFCs, corresponding registry lines will be flagged as extreme event;
- in case of errors, the NFC will have to correct the errors and resubmit the whole survey through the data submission module. The data then has to pass through the complete set of checks (compliance, uniformity and conformity) again.
- if no answer was delivered by the NFC before the deadline and/or errors are still identified, data were not loaded into the Forest Focus Monitoring Database.

3 LEVEL II 2004 MONITORING DATA

The review given in this *Executive Summary Report* relates to data from the 2004 monitoring period collected at the intensive monitoring plots of the scheme. The status of submitted data is given up to 10.03.2006. Results of the validation process include data received by 02.11.2006 and any additional information provided by that date. Further details referring to the 2004 data submission status and analysis may be found in the related *Technical Report for 2004 Level II Data* (Hiederer, *et al*. 2007).

3.1 Schedule for Data Submission

According to the stipulation of the communication sent to countries participating in the scheme data for 2004 should have been submitted to DG JRC by 31.12.2005. Having to manage data from three monitoring periods under a new environment put a heavy strain on NFCs. As a consequence, the scheduled deadlines had to be extended several times to allow for more surveys to enter the validation procedure. The situation also demanded meticulous management practices in data handling and responding to requests for assistance.

The sequence of data submissions for the checks performed on the data from the data submission date is graphically presented in Figure 2.

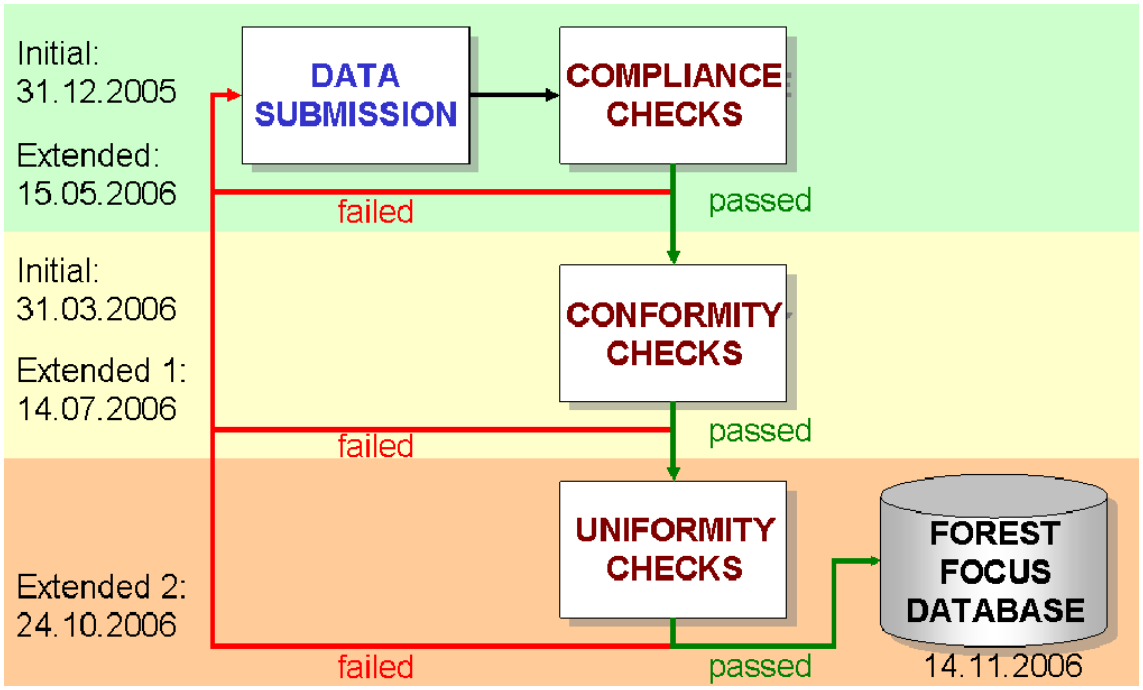

Figure 2: Data Validation Schedule for 2002, 2003 and 2004 Data

For Compliance data could be submitted until 15.05.2006. For Conformity data could be submitted until 14.07.2006 and for Uniformity data could be submitted until 24.10.2006. Some NFCs asked for an extension of the submission period in October. The status of the data processed was set to the situation as of 02.11.2006.

4 PROCESSING OF 2004 MONITORING DATA

The processing period of 2006 was unusual in as data from 3 years (2002, 2003 and 2004) had to be received, managed and processed. While the Compliance Check could be performed for any form submitted, tests related to Conformity and Uniformity include time-series analyses over several consecutive years. As a consequence, some Uniformity tests could not be performed following the absence of a time-series to analyse.

4.1 Data Submission and Compliance Checks

For 2004 monitoring the participating states had for the first time the opportunity to submit data through the web-based Data Submission Module (DSM). The DSM allows the submitting authorities direct online checks of the data in form of a general and a detailed report. The reports are generated automatically for each survey submitted. They contain the information on the status of the survey and information for each warning or error found in the data with a comment on the nature of the problem.

4.1.1 Data Submission Status

An overview of the status of data submitted by NFC is given in Figure 3. In total 22 National Focal Centres (NFC) had submitted data by the date when the status was determined. Numerous NFCs faced problems respecting the data format as defined in the *ICP Forests Manual* and the *DG JRC Technical Specifications*. This resulted in a low ratio of compliant and/or complete submissions.

Two extra deadlines were accordingly given in order for countries to complete their submission and/or to correct their submission and submit compliant files. Figure 4 presents the number of submitted surveys by NFC at the date, which forms the basis for processing 2004 data (02.11.2006).

The graph shows that the number of NFC submitting data increased to 26. It was also noted that the number of non-compliant data was drastically reduced and that only a few of the submitted surveys were not compliant.

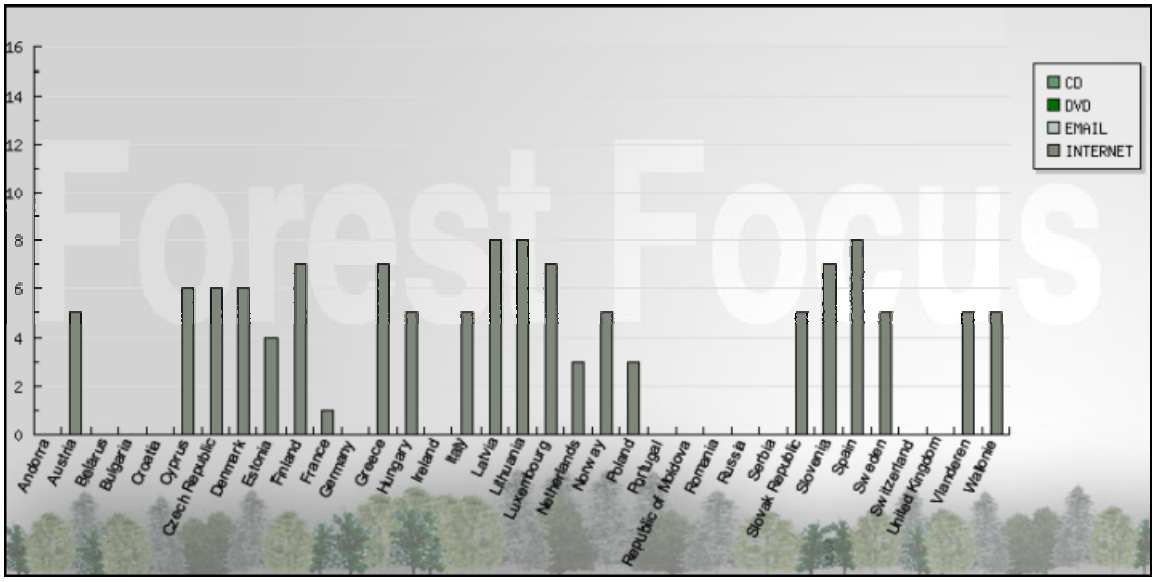

Figure 3: Number of Submitted Surveys by NFC and Delivery Mean (2004 Monitoring period. Status 10.03.2006)

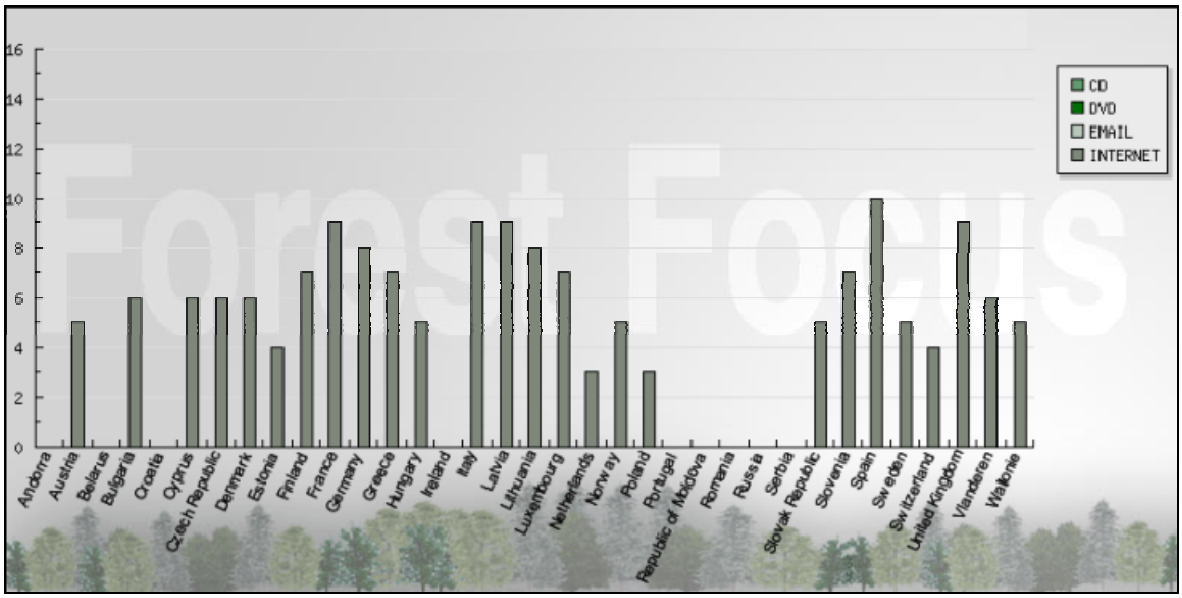

Figure 4: Number of Submitted Surveys by NFC and Delivery Mean (2004 Monitoring period; Status 02.11.2006)

4.1.2 Data Compliance Status

The status of surveys submitted by NFC at the end of the main processing period is summarized in Table 1.

Table 1: Compliance Status for each Survey by NFC for the Year 2004

Country	Survey												
	SI	CC	SO	SS	FO	GR	DP	MM	GV	PH	AQ	OZ	LF
Austria		W		O	O		W	W					
Bulgaria		W		W			W	W			W		W
Croatia													
Cyprus	O	W					W	O	O		O		
Czech Republic	O	E		O			O	O	O				
Denmark	O	W		W			W	W					W
Estonia		W		W		W	W						
Finland	O	W		W		W	W	W	O				
France		W		W		W	E	W		W	W	E	W
Germany	O	O		O	O	W	O	O	O				
Greece	O	W		W			W	W			O		W
Hungary		O					W	W		W		W	
Ireland													
Italy	W	O		O			W	O	O		W		
Latvia	O	O	O	O	O	W	O		O			W	
Lithuania		O		O	W		W		O		O	W	W
Luxembourg		W				W	W	W		O	O		W
Netherlands		O		O			W						
Norway		W		W		W	W		O				
Poland		W		O			O						
Portugal													
Romania													
Serbia													
Slovak Republic		W		O		W	W		O				
Slovenia	O	W		O			W	W	O	W			
Spain		O		O	O	O	O	O		O	O		
Sweden		O		W		W	W	W					
Switzerland		W						W					
United Kingdom	O	W		O		W	W	W	W		O	O	
Vlanderen		W		W		W	W	W		W			
Wallonie	O	O		O			W	O					
TOTAL	**12**	**26**	**1**	**22**	**5**	**12**	**25**	**19**	**11**	**6**	**9**	**5**	**6**
Relative OK	92%	36%	100%	60%	80%	8%	20%	32%	91%	33%	67%	20%	0%
Relative OK or OK with Warning	100%	96%	100%	100%	100%	100%	96%	100%	100%	100%	100%	80%	100%

Status: 02.11.2006

O	= OK	W	= OK with warnings	E	= Errors detected

For 2004 forms were submitted for all surveys. A total of 159 surveys were received. Most data were received for Crown Condition (26), Deposition (25) and Soil Solution (22). Only one survey for Soil condition was received (Latvia), which is only sampled every 10 years.

Of all surveys submitted 68 (43%) were tested OK. Tested with warnings were 88 surveys (55%), while only 3 generated error messages (2%). One should note that warnings are frequently given in case an optional form was not submitted. Warnings are reminders for the NFCs to re-examine their data and do not prevent the data from being further processed. Only the 3 surveys generating an error could not enter the next validation stage of data conformity checks, which translates into 98% of surveys passing the compliance tests.

4.2 Conformity Check

Following the Compliance Check NFCs were informed with respect to any problems encountered when checking data for conformity. Each NFC received an automatically generated detailed processing status report, in which the problems met were presented. A request for correction(s) and/or confirmation(s) was included in the report.

4.2.1 Data Conformity Status

The data conformity status is given in Table 2 for each survey, participating country and for the three monitoring years (2002/2003/2004). It should be noted that only files having passed the Compliancy Check can be tested for conformity. This condition was of significant impact to the analysis of 2004 data, since the data conformity include tests on temporal stability of parameters. In the absence of validated data from preceding years a temporal analysis is not possible. For example, when 2004 data for the survey are compliant and 2003 and/or 2002 data are not (tested with error) the tests cannot be performed and the data cannot be fully validated.

Table 2: Data Conformity Status 2002, 2003 and 2004

Year 200-	Survey																				
	SI			CC			SO			SS			FO			GR			DP		
	2	3	4	2	3	4	2	3	4	2	3	4	2	3	4	2	3	4	2	3	4
AD																					
AT				N	N	✓				N	N	N	N	N	N				N	N	N
BG					✓	N		✓			N	✓		✓						N	N
BY																					
CH	N					N				✓									✓	✓	
CS																					
CY			✓			✓															N
CZ		✓	✓								N	N		N					N	N	N
DE	N	✓	✓	N	N	N				N	N	N	N	N	N	N	N	N	N	N	N
DK	N	N	✓	✓	✓	✓				N	N	✓		N							N
EE		N		N	N	N				N	N	N		N				N	N	N	N
ES				N	✓	✓				N		N	N		✓	N	N	N	N	✓	N
FI			N			N					N	✓		✓				N		N	N
FR				N		✓				N	N	N				N	N	N			
GR	N	✓	✓	✓	✓	✓					✓	✓		✓					✓	N	✓
HR																					
HU				N	✓	✓								✓							N
IE													✓	N							
IT	N		N			N				N	N	N		N					N	N	N
LT				N	N	N				✓	✓	✓	✓		✓				✓	✓	✓
LU				N	✓	✓								✓				N	N	N	N
LV			✓			N			N			✓			✓			N			N
MD																					
NL	N			✓	N	N				N	N	N		N					N	N	N
NO				N	N	✓				N	N	N		✓				N	N	N	N
PL						N						N									N
PT																					
RO																					
RU																					
SE				N	✓	✓				N	N	N	N					N	N	N	✓
SI			✓			✓						✓									✓
SK				N	N	✓						N				N	N	N		N	N
UK		N	N	N	N	N				N	N	N	N	N				N	N	N	N
BE	N	N	✓	N	✓	✓				N	N	N		N				✓	N	N	N
TOTAL	7	7	11	16	16	24	0	1	1	14	16	21	7	16	5	4	4	12	15	18	23
Conform	0	3	8	3	8	12		1	0	2	2	7	2	6	3	0	0	1	3	3	4

✓: Data conform
N: Data not conform

Table 2: Data Conformity Status 2002, 2003 and 2004 (continued)

Year 200-	Survey																	
	MM			GV			PH			AQ			OZ			LF		
	2	3	4	2	3	4	2	3	4	2	3	4	2	3	4	2	3	4
AD																		
AT	N	N	N															
BG		N	N		N						✓	✓						✓
BY																		
CH	N	N	N		N													
CS																		
CY			N			✓						✓						
CZ	N	N	N		✓	✓												
DE	N	N	N	N	N	N												
DK	N	N	✓															✓
EE																		
ES	✓	✓	✓				N	N	N	N	✓	✓						
FI	✓	N	N			✓												
FR	✓	✓	✓				✓	✓	✓	✓		✓				✓	✓	✓
GR	✓	✓	✓									✓						✓
HR																		
HU	N	N	N		✓		N	N	N						✓			
IE																		
IT	N	N	N	✓	✓	✓				✓	✓	✓						
LT						✓						✓			✓			✓
LU	N	N	N				✓	✓	✓	N	✓	✓				✓	✓	✓
LV						✓									✓			
MD																		
NL																		
NO					N	N												
PL																		
PT																		
RO																		
RU																		
SE	N	N	✓															
SI			✓			✓			✓									
SK						N												
UK	N	N	N			✓				✓	✓	N			✓			
BE	✓	✓	✓	✓	N				✓									
TOTAL	15	16	18	3	8	11	4	4	6	5	5	9			4	2	2	6
Conform	5	4	7	2	3	8	2	2	4	3	5	8			4	2	2	6

✓: Data conform
N: Data not conform

4.2.2 Summary of Conformity Check

The conformity tests were performed for each survey that passed the Compliance Check. In total 5050 tests on the surveys were performed. The tests were passed in 82% of the cases. The results of tests with warnings or errors were communicated to the NFCs concerned for verification of the situation or correction of any erroneous data. The various tables describing the analysis made by country may be consulted in the related *Technical Report*.

The initial test routines used for the Conformity Check detect unlikely values for a defined data range (outside approximately 95% of cases). The range limits were mostly derived from the Level II legacy data validated by the Forest Intensive Monitoring Coordinating Institute (FIMCI) and from expert knowledge. Therefore, a value outside the ranges does not necessarily mean that a value is erroneous and should be rejected. The NFCs are asked to pay attention to those values and state if the values are accurate and should be treated outliers, or if the data need corrections and have to be re-submitted.

The range tests triggered many warnings, especially for measurements in the forms of the Meteorological survey. The reasons are the large amount of data and therefore a higher probability of identifying outliers, the fact that in the legacy data countries from the Pontic and Mediterranean Region such as Bulgaria, Hungary or Cyprus are less prominent in the legacy, and ultimately extreme years will give rise to more warnings. Another factor contributing to the number of messages for the meteorological data is that the ranges are set to be the same for all countries. This makes it easier to reconstruct testing conditions, yet it means that countries with an intermediate climate tended to receive fewer warnings with the potential in these cases that some outliers may be overlooked.

Besides the numerous warnings for values outside the ranges in the meteorological surveys the most common warnings and errors were caused by:

- changes in static parameters, such as tree species;
- continuity of the change of variable values, such as age of tree;
- the treatment of missing values and values below the detection/quantification limits.

Most of the detected errors in changes of static parameter were due to the occurrence of new trees on the plots, individual trees that changed species type over time, and changes in coordinates or altitudes. Reasons for these changes were that a plot or a tree was assessed the first time, the location of a plot had changed, or the previous submitted value was incorrect or measured with less accuracy, in particular plot co-ordinates.

Warnings concerning continuity of changes with an abnormal progression were mainly found in data of the Growth Assessment survey; for instance the occurrence of apparently “shrinking” trees, meaning the diameter or the height is smaller than in the previous measurement. In many cases the data were corrected by the NFCs and re-submitted. However, some situations were also confirmed by NFCs following an unusual time interval between two measurements, incorrect measuring technique applied during previous assessments, or stem breaks.

A particular problem was encountered associate with values of "-1" and zero. A high number of warnings mainly in the data of the Soil Solution and Deposition surveys were due to the use those values. The "-1" values were in most cases confirmed by the NFCs as a code for measurements below the detection limit of instrument used. The disparate use of zero entries was found to pose a significant problem to the meaning of the measurement. The value was used to code the absence of a measurement, code values below the field format limit (rounded to "0") and measurement outside the detection / quantification limit. As a consequence, specific recommendations with respect to the use of "-1" and zero in the data were set down by DG JRC and communicated to the NFCs.

4.3 Uniformity Check

The tests applied for the Uniformity Check provide an interpretation of temporal and spatial development of parameters. The tests include an automatic procedure for generating tables, graphs and maps. Results are manually interpreted by experts. The analysis of 2004 data was limited by the amount of data that passed the conformity tests within the deadlines for data submission or correction. The findings are presented for Crown Condition, Soil Solution and Deposition.

4.3.1 Crown Condition

A map depicting mean defoliation of *Pinus sylvestris* for Level II plots for 2004 is given by Figure 5.

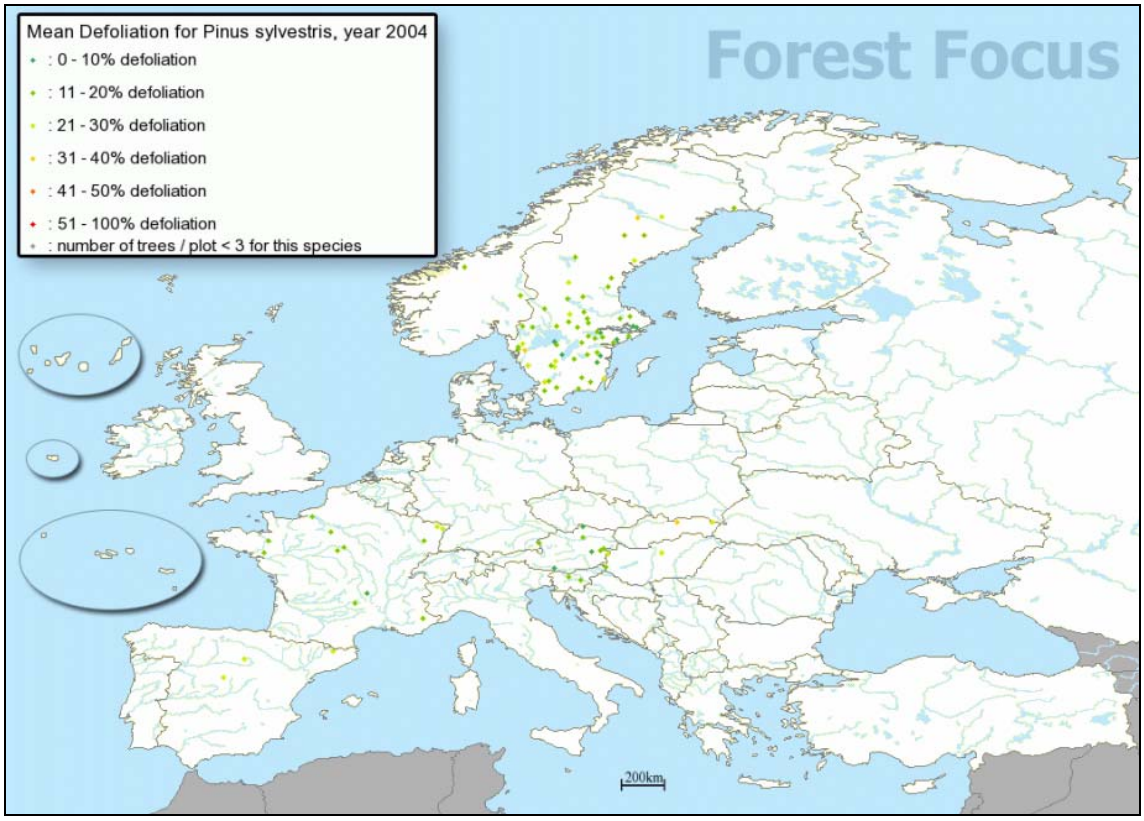

Figure 5: Mean Defoliation of Pinus sylvestris

By far the largest amount of validated data on mean defoliation for *Pinus sylvestris* is available for plots located in southern Sweden. The plots in this area show a mean defoliation between 0 and 20%, but there are also several plots showing defoliation of up to 30% and two with up to 40%. For the area concerned the results were compared with defoliation reported on Level I plots. In fact, most of the Level I plots show also a mean defoliation between 0 and 20%, with many plots reaching up to 30% defoliation (Lorenz, *et al*., 2004). The moderate defoliation found at Level II plots is confirmed by the results of the survey at Level I.

Data from plots in Austria, France, Norway and Slovenia show a similar trend to the one observed for Sweden. For plots in Hungary, Slovak Republic and Spain mean defoliation exceeds the values found at the other sites, reaching up to 40%, but not above. While no specific spatial trend can be deduced from the data they suggest that mean defoliation for *Pinus sylvestris* often reached values above 30%.

The results of mapping mean plot defoliation of *Picea abies* are shown in Figure 6.

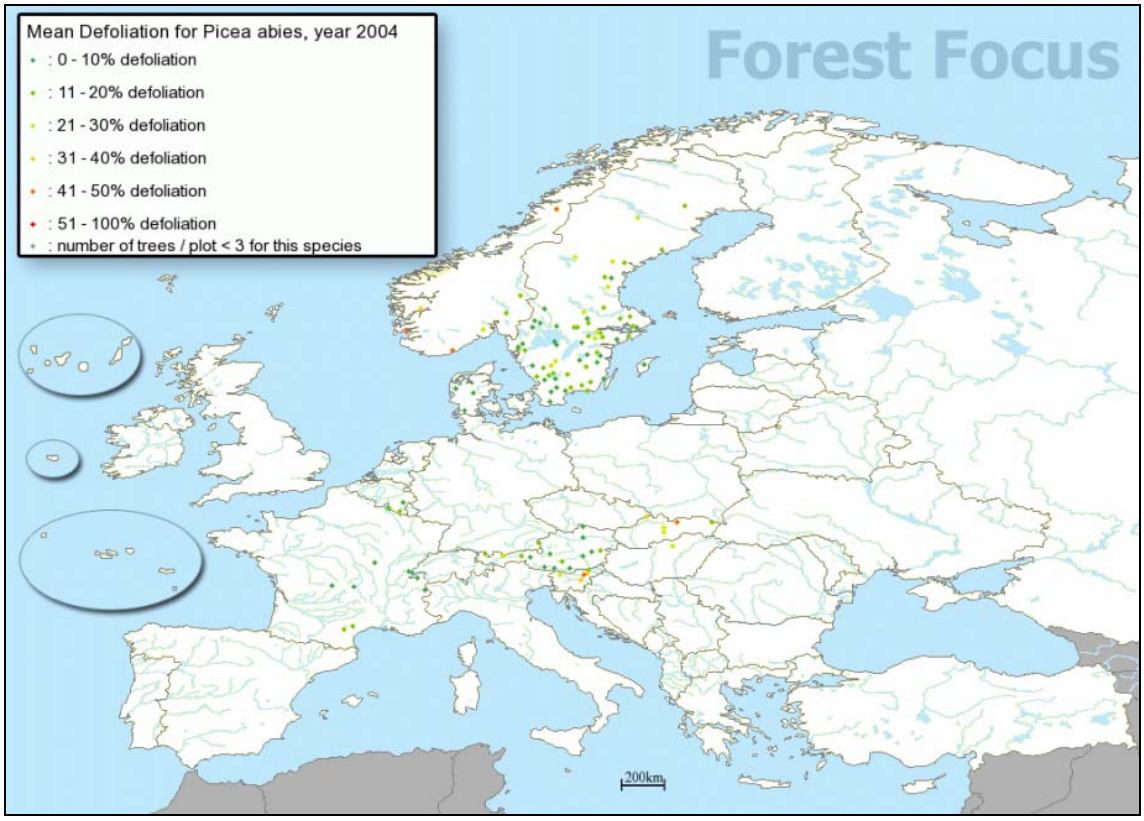

Figure 6: Mean Defoliation for Picea abies

The highest density of plots with data for this species is found in southern Sweden and Austria. The trees on those plots mainly show moderate defoliation below 20%. A similar development can be observed for plots in Belgium (Wallonie), Denmark, France and Hungary. Compared to *Pinus sylvestris* mean defoliation of *Picea abies* on the Level II plots is more variable in Norway, Slovak Republic and Slovenia. On those plots mean defoliation is generally above 30% and in cases above 50%. This higher variability was also found on Level I plots, as documented by ICP Forests.

The mean plot defoliation of *Quercus robur* and *Qu. petraea* on Level II plots in 2004 is shown in Figure 7.

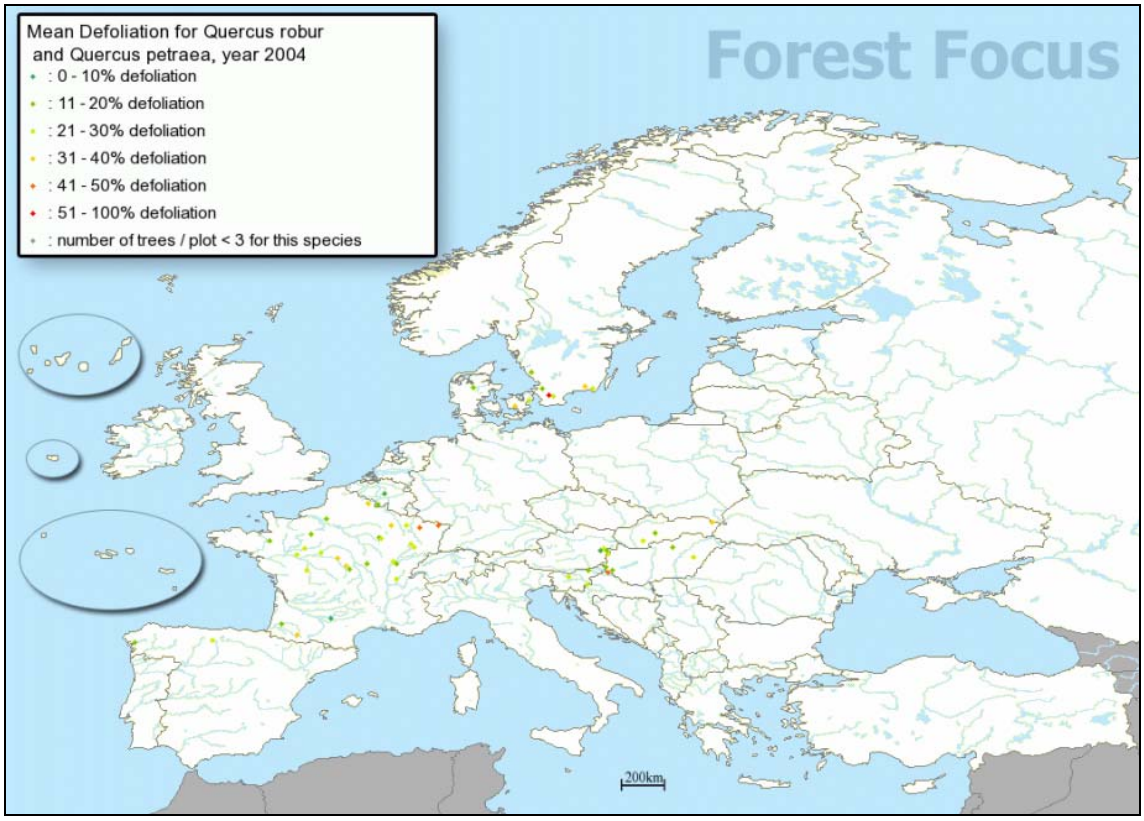

Figure 7: Mean Plot Defoliation of Quercus robur and Qu. petraea

For these *Quercus* species data from Level II plots collected in 2004 show widespread defoliation from moderate levels of defoliation for plots in Austria, Belgium and some parts of France with values below 20%. Much higher levels of mean defoliation, at times exceeding 50% for the species, were reported for Denmark, central and eastern parts of France, southern Sweden, Slovenia and Slovak Republic. A comparison with the results of the assessment on Level I plots published in the *EU/ICP Forest Condition Report 2005* indicates no obvious outliers or inconsistencies in the mapped data and the described pattern could be confirmed by the findings reported for Level I plots.

The mean defoliation for *Fagus sylvatica* is presented in Figure 8. The level of defoliation appears to be at least as variable as for *Quercus robur* and *Qu. petraea*. Values exceeding 50% were found for one plot in France and one in Hungary. Less damaged seem to be trees on plots in Austria, Belgium (Wallonie) and Denmark.

It would be inappropriate to derive any regional trend from the data reported for the plots with *Quercus robur* and *Qu. petraea* without data of a more geographic distribution, although the data indicate a general tendency for relatively high spatial variations.

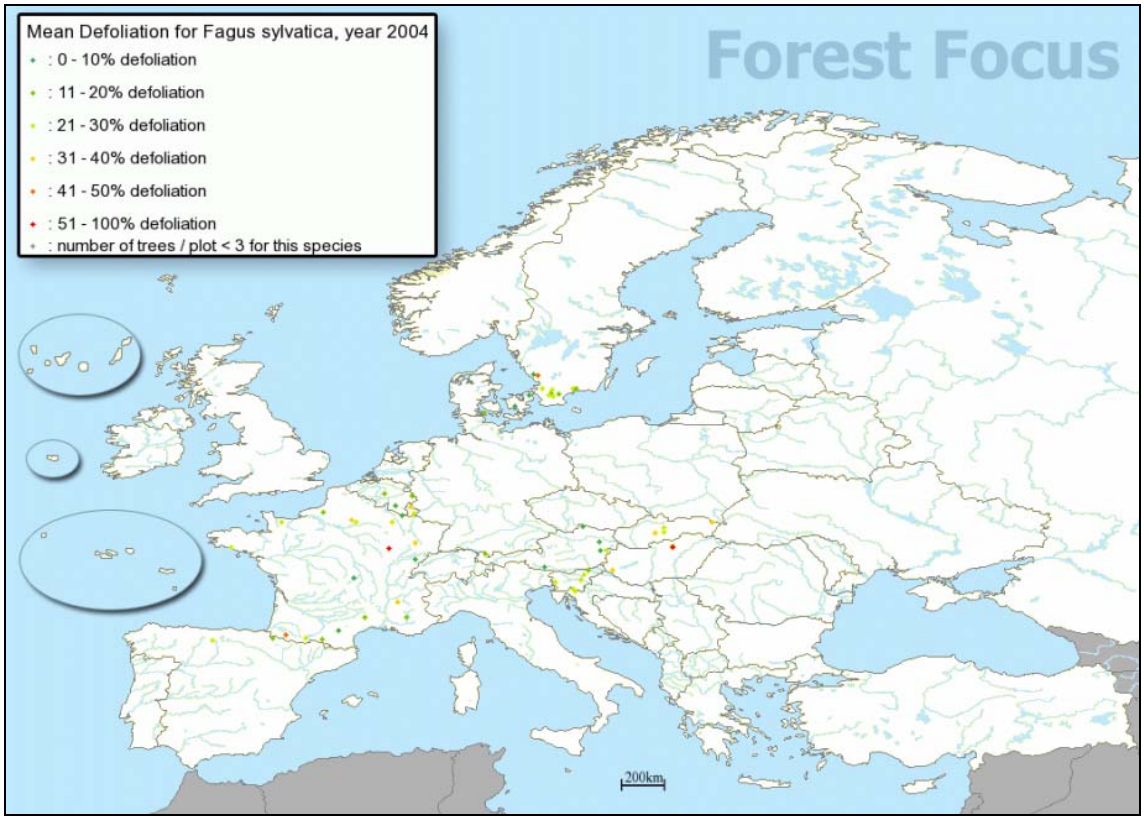

Figure 8: Mean Plot Defoliation of Fagus sylvatica

4.3.2 Soil Solution

A graphical presentation of the data for 2004 for the parameter S-SO_4 is given in Figure 9. The only plots with any density of data are those located in Finland. The average SO_4 concentration for a plot over the mean annual concentration of the previous 5 years could be calculated for two plots. Data for 2004 were available for more plots, but no values were available for any of the previous 5 years. The data available are considered insufficient to pronounce any specific trend over time or space.

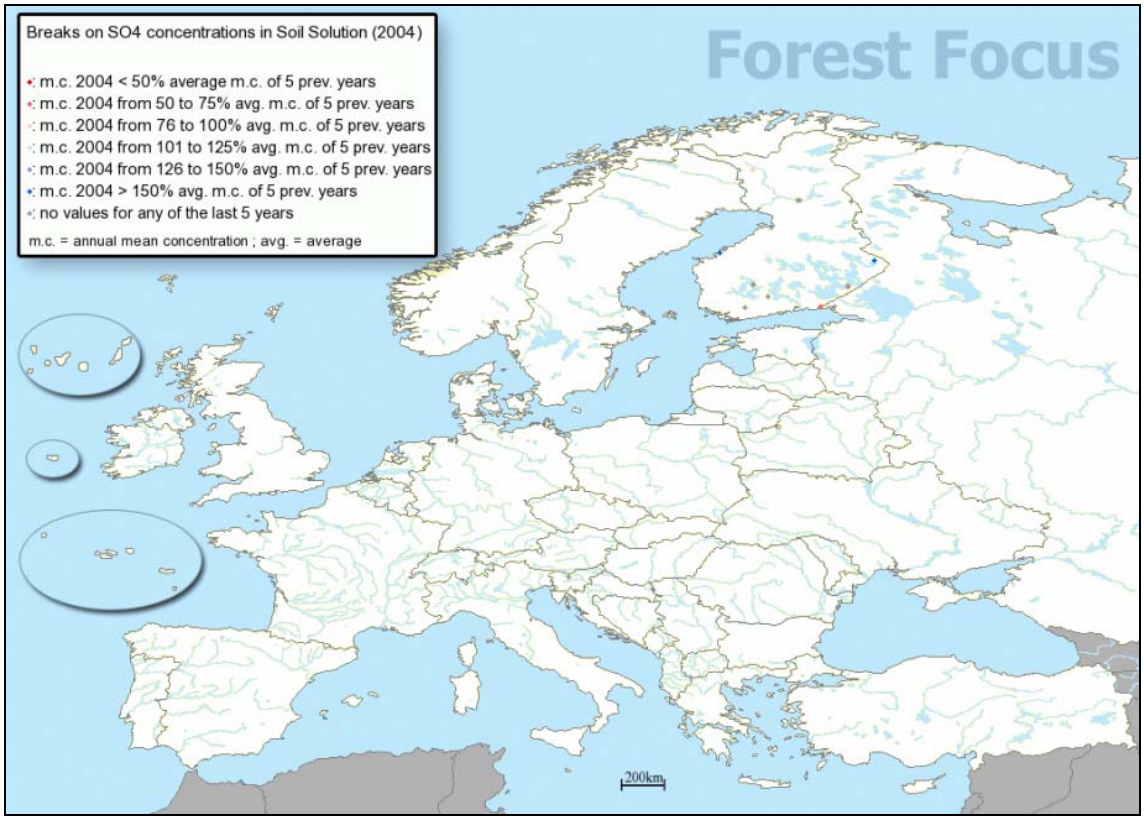

Figure 9: S-SO_4 Concentration in Soil Solution

Data for N-NO_3 were available for plots in Finland and one plot in Slovenia. For those plots the nitrate concentration is below 50% of the average concentration measured for the previous 5 years. This is considered within the limits of the temporal data variability.

For plots with data for N-NH_4 the observed trend is very similar to that found for nitrate. The concentrations reported were generally below 50% of the average concentration measured for the previous 5 years. This is considered within the limits of the temporal data variability and does not provide any evidence on which rejecting the data could be based.

4.3.3 Deposition

Uniformity tests for deposition data are based on showing the values reported for S-SO_4, N-NO_3 and N-NH_4 in two series of maps. The first series shows the plotwise quantity weighted (volume of sampled precipitation) mean concentration of bulk deposition for S-SO_4, N-NO_3 and N-NH_4 in mg/l for the particular reporting year. The value is calculated as:

$$Quantiy-weigthed \quad mean \quad concentration_{dep} = \frac{\sum deposition \times quantity_{dep}}{\sum quantity_{dep}}$$

The calculations of quantity weighted mean concentration is necessary, because various instances of periodic measurements are submitted for a particular year. The calculations are only applied to data of plots for which data were submitted for at least 300 days (plot specific sum of period lengths in the PLD form). The second series of maps takes precipitation of the respective year into account as a major additional influence on the concentrations. The purpose of those maps is to reveal sudden changes in concentrations of the depositions related to the amount of water (quantity of precipitation) in the bulk deposition.

The quantity-weighted mean S-SO_4 concentrations in bulk deposition for 2004 are given in Figure 10. Plots for which deposition data could be validated, are situated mainly in Sweden and Greece. Sulphate deposition on these plots range from 0.176 to 0.785 mg/l. The depositions measured in Sweden are low when compared to the European average. An example for very high depositions is described by ICP Forests in Poland, where sulphate depositions up to 10.3 mg/l were found. Sulphate depositions observed on plots in Greece, Lithuania and Slovenia were higher than for most Swedish plots, but almost an order of magnitude below those reported for areas of high influx. For areas of expected high depositions data from Level II plots for 2004 could not enter the Uniformity Check.

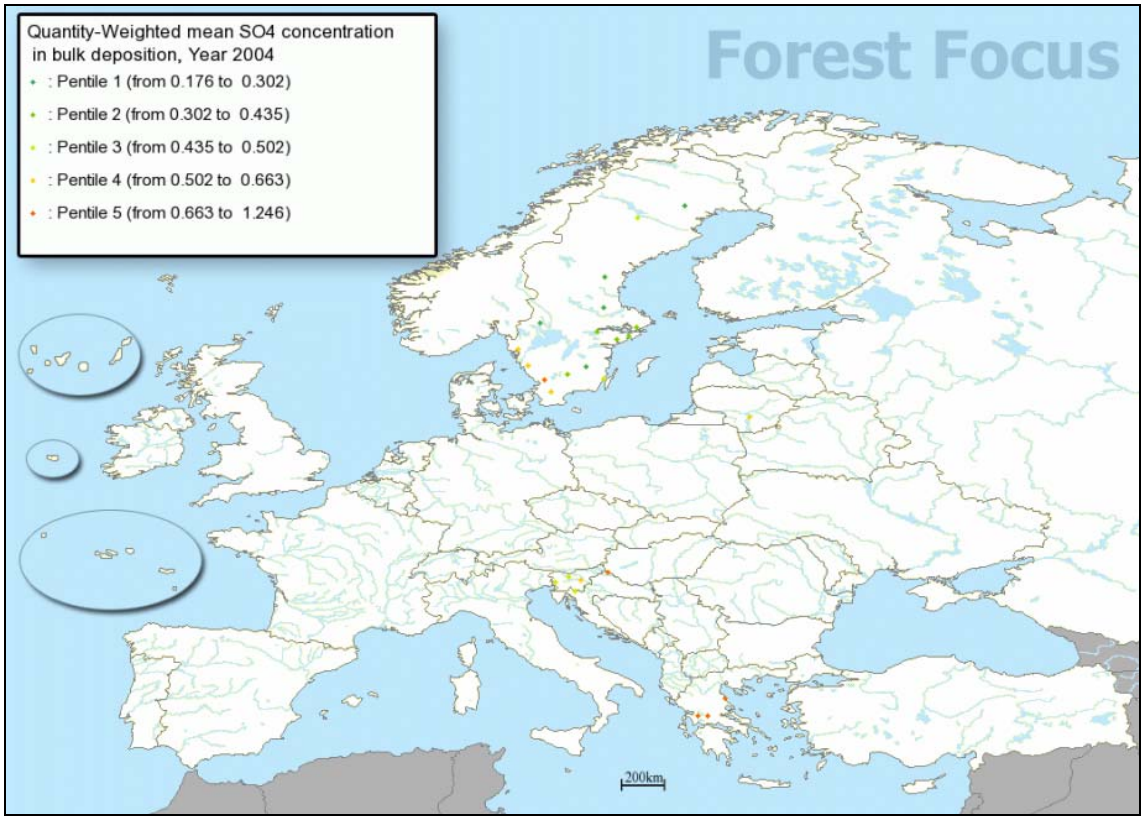

Figure 10: Quantity-Weighted Mean SO_4 Concentration in Bulk Deposition

Plots with conform data for N-NO_3 concentrations in bulk deposition are located in Sweden, some in Lithuania, Slovenia and Greece. As for sulphur, the nitrate depositions

measured in Sweden are low as compared to the European average. Nitrate depositions on these plots range from 0.154 to 0.61 mg/l and are highest in southern Sweden. This corresponds well with the results obtained for the years 1991-2001 on the Swedish plots (Lorenz, *et al*., 2004).

The quantity-weighted mean $N\text{-}NH_4$ concentration on plots in Sweden range from 0.054 to 1.496 mg/l. The depositions measured in Sweden are low as compared to the European-wide average. An example for very high depositions is described by ICP Forests in northern Germany and in Poland, where ammonium depositions up to 2.6 mg/l were found. However, the values reported are well within the expected ranges.

The data for deviations in the quantity-weighted mean depositions of the monitoring year from the average deposition reported over the previous 5 years are available for plots in Finland, Greece and Slovenia. For the large majority of plots the substances deposited for 2004 were found to be below the average of the values from the previous 5 years and quite frequently below 50% of the average value. However, the values were not found to be outside the range of observations and no evidence was found that they could not be accepted for any of the plots validated.

4.4 Data Stored in Forest Focus Monitoring Database

The surveys of 2004 that could be uploaded to the Forest Focus Monitoring Database for each country are given in Table 3.

Table 3: Surveys uploaded to the FMD after Validation Checks

Country	Survey												
	SI	CC	SO	SS	FO	GR	DP	MM	GV	PH	AQ	OZ	LF
AD													
AT		✓											
BG				✓							✓		✓
BY													
CH													
CS													
CY	✓	✓							✓		✓		
CZ	✓								✓				
DE	✓												
DK	✓	✓		✓				✓					✓
EE													
ES		✓			✓			✓			✓		
FI				✓					✓				
FR		✓						✓		✓	✓		✓
GR	✓	✓		✓			✓	✓			✓		✓
HR													
HU		✓										✓	
IE													
IT									✓		✓		
LT				✓	✓		✓		✓		✓	✓	✓
LU		✓								✓	✓		✓
LV	✓			✓	✓				✓			✓	
MD													
NL													
NO		✓											
PL													
PT													
RO													
RU													
SE		✓					✓	✓					
SI	✓	✓		✓			✓	✓	✓	✓			
SK		✓											
UK									✓			✓	
BE	✓	✓				✓		✓		✓			
Total	**8**	**13**	**0**	**7**	**3**	**1**	**4**	**7**	**8**	**4**	**8**	**4**	**6**

At the end of the validation process 73 surveys from 21 countries were uploaded into the Forest Focus Monitoring Database. In 19 cases the surveys were uploaded after clarification from the NFCs were received concerning warnings or errors generated during the Conformity Check. Most of the surveys that were loaded were from the Crown Condition (13 NFCs), Meteorology and Air Quality (8 NFCs) and from the Ground Vegetation assessment (7 NFCs). Soil Condition data should be submitted only every ten years and only one NFC submitted data, which failed the conformity checks.

Validating 2004 data has been found challenging, because the process requires validated data from preceding monitoring years. Conformity and Uniformity checks include tests of data a part of a time series analysis. That means surveys with an annually observation interval, like Crown Condition, must be available in a compliant and conform status for the years 2002 to 2004. This prerequisite has limited the amount of validated data and, as a consequence, the amount of data which could be uploaded into the Forest Monitoring Database. Several periods allowing NFCs to re-submit corrected data are scheduled for 2007. This option should enlarge and finalise the basis of validated data in the database.

5 SUMMARY

In the process of validating Level II data various situations leading to anomalous values were detected. Most of the irregular conditions found by the conformity tests were caused by values outside the ranges in the Meteorological surveys, but also by changes in static parameters like the occurrence of new trees on the plots or changes in plot coordinates over time, continuity of the change of variable values like anomalous tree increment (shrinking trees) and the treatment of missing values and values below the detection/quantification limits.

The latter were mainly detected in surveys for Soil Solution and Deposition. NFCs have used different interpretations to represent missing values and values below the detection/quantification limits of the instrument used. A value of "-1" was confirmed in most cases by the NFCs as a code indicating measurements below the detection limit of the instrument. However, zero was variously used to code the absence of a measurement, values below the field format limit (rounded to zero) or for measurements outside the detection / quantification limit. The recommendation for the data submission is to use "-1" for measurements below the detection limit of the instrument used and to leave a field blank if no measurement was carried out. The detection limits of the instrument used should be reported in the Data Accompanying Reports, which should be submitted together with the data.

The findings obtained from the various stages of validating the data were communicated to the NFCs. As a result, the number of surveys could be expanded and data quality could be improved by NFCs correcting and re-submitting data or by confirming data outside the limits of the range test. At the end of the validation phase carried out in 2006 on data from the 2004 monitoring period 73 surveys from 21 countries were uploaded into the Forest Focus Monitoring Database. The validation process will be continued in 2007 also for newly re-submitted 2004 data to attain a database with a maximum of validated data.

In order to further improve the quality of the data submitted for Level II plots the following recommendations are made:

- The existing data format specifications as published by DG JRC for a given monitoring year should be followed closely.
- The data formats in use should be revised by the Expert Panels in charge of the various parts of the ICP Forests Manual with respect to the dimensions of the fields used.
- Definitions of data fields should be co-ordinated to specify a single format to data common in several forms.
- The division of information reported on the various data forms should be revised and guided by principles of avoiding data duplication and supporting data integrity.

- Any changes to the monitoring setup or instruments used should be documented as DARs.
- In the standardised environment of measuring parameters on Level II plots many attributes are assumed implicitly and therefore not reported. It is therefore very important that measurements are performed according to those standards.
- Where alternative methods are allowed by the instructions the choice of which option has been used should be part of the data submitted and stored in the database.
- Missing data and measurements below the detection limit of the instrument used should be coded according to the guidelines provided. A value of zero should never be used to indicate a missing measurement for non-categorical parameters.

The results obtained from validation and evaluation activities are encouraging and lead to the conclusion that the validated Level II data can provide a sound basis for scientific studies of high relevance to the ongoing processes of international environmental policies. This holds true in particular for questions related to biodiversity, climate change, carbon sequestration, air pollution and sustainable forest management. The relevant scientific studies, however, will require scientific expertise in many related fields and close cooperation with ICP Forests would be beneficial.

Bibliography

Augustin, S., W. De Vries, C. Müller-Edzards, K. Stefan and L. Vanmechelen (1997) Forest Condition in Europe. Executive Report 1997. UN/ECE and EC, Geneva and Brussels, 41 pp.

Augustin, S., A. Bolte, M. Holzhausen and B. Wolff (2005) Exceedance of critical loads of nitrogen and sulphur and its relation to forest conditions. European Journal of Forest Research, 124 (4), p. 289-300.

De Vries, W., G. J. Reinds, C. van der Salm, G.P.J. Draaijers, A. Bleeker, J.W. Erisman, J. Auee, P. Gundersen, H.L. Kristensen, H. Van Dobben, D, De Zwart, J. Derome, J.C.H. Voogd and E.M. Vel (2001) Intensive Monitoring of Forest Ecosystems in Europe. Technical Report 2001. UN/ECE and EC, Geneva and Brussels, 177 pp.

De Vries, W., G.J. Reinds, H. van Dobben, D. de Zwart, D. Aamlid, P. Neville, M. Posch, J. Auée, J.C.H. Voogd and E.M. Vel (2002) Intensive Monitoring of Forest Condition in Europe: Technical Report 2002. UN/ECE and EC, Geneva and Brussels, 175 pp.

De Vries, W., G.J. Reinds, M. Posch, M.J. Sanz, G.H.M. Krause, V. Calatayud, J.P. Renaud, J.L. Dupouey, H. Sterba, E.M. Vel, M. Dobbertin, P. Gundersen, J.C.H. Voogd. (2003) Intensive Monitoring of Forest Ecosystems in Europe. Technical Report 2003. UN/ECE and EC, Geneva and Brussels, 161 pp.

European Commission (ed) (2006a) Forest Focus Monitoring Database System – 2004 Data Submission Report. DG JRC, Institute for Environment and Sustainability, Ispra, Italy. 68pp.

European Commission (ed) (2006b). Forest Focus Monitoring Database System – Technical Specifications for Monitoring Year 2005. European Commission DG Joint Research Centre, Institute for Environment and Sustainability, Ispra, Italy. 102pp.

European Commission (ed) (2006c). Forest Focus Monitoring Database System – Technical Specifications for Monitoring Year 2004. European Commission DG Joint Research Centre, Institute for Environment and Sustainability, Ispra, Italy. 100pp.

European Commission (ed) (2006d). Forest Focus Monitoring Database System – Technical Specifications for Monitoring Year 2003. European Commission DG Joint Research Centre, Institute for Environment and Sustainability, Ispra, Italy. 100pp.

European Commission (ed) (2006e). Forest Focus Monitoring Database System – Technical Specifications for Monitoring Year 2002. European Commission DG Joint Research Centre, Institute for Environment and Sustainability, Ispra, Italy. 98pp.

European Commission (ed) (2005a) Forest Focus Monitoring Database System – 2003 Data Submission Report. DG JRC, Institute for Environment and Sustainability, Ispra, Italy. 41pp.

European Commission (ed) (2005b) Forest Focus Monitoring Database System – 2002 Data Submission Report. DG JRC, Institute for Environment and Sustainability, Ispra, Italy. 41pp.

Hiederer. R. T. Durrant, O. Granke, M. Lambotte, M. Lorenz, B. Mignon (2007) Forest Focus Monitoring Database System – Technical Report 2004 Level II Data. EUR 22711 EN. Office for Official Publications of the European Communities, Luxembourg. 346pp.

Lorenz, M., V. Mues, G. Becher, W. Seidling, and R. Fischer (2001) Forest Condition in Europe. 2001 Technical Report. UN/ECE and EC, Geneva and Brussels, 103 pp.

Lorenz, M., V. Mues, G. Becher, W. Seidling, R. Fischer, D. Langouche, D. Durrant and U. Bartels (2002) Forest Condition in Europe. 2002 Technical Report. UN/ECE and EC, Geneva and Brussels, 160 pp.

Lorenz, M., V. Mues, G. Becher, C. Müller-Edzards, S. Luyssaert, H. Raitio, A. Fürst and D. Langouche (2003) Forest condition in Europe. 2003 Technical Report. UN/ECE and EC, Geneva and Brussels, 113 pp + Annexes.

Lorenz, M., V. Mues, G. Becher, R. Fischer, E. Ulrich, M. Dobbertin and S. Stofer (2004) Forest condition in Europe. 2004 Technical Report. UN/ECE and EC, Geneva and Brussels, 113 pp + Annexes.

Lorenz, M., G. Becher, V. Mues, R. Fischer, R. Becker, V. Calatayud, N. Diese, G.H.M. Krause, M. Sanz and E. Ulrich (2005) Forest Condition in Europe. Technical Report 2005. UN/ECE, Geneva, 99 pp + Annexes.

Lorenz, M., R. Fischer, G. Becher, V. Mues, W. Seidling, P. Kraft and H-D. Nagel (2006) Forest Condition in Europe. Technical Report 2006. UN/ECE, Geneva, 113 pp + Annexes.

Nigot, S., B. Mignon and R. Hiederer (2006) Forest Focus Monitoring Database System – Submission Module User Manual. EUR 22184 EN, Office for Official Publications of the European Communities, Luxembourg. 29pp.

Ouimet, R., L. Duchesne, D. Houle, P. A. Arp (2001) Critical loads and exceedances of acid deposition and associated forest growth in the northern hardwood and boreal coniferous forests in Québec, Canada. Water, Air, and Soil Pollution: Focus 1: p.119-134.

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Abstract
This Executive Summary Report for 2004 Level II data supplements the Technical Report for the same monitoring year. It presents a concise account of the data submitted and the results obtained from validating the data. Problems encountered with a general character and particularities with significant consequence on the overall project are included in the report. For details and technical background of the data and the validation process the 2004 Technical Report should be referred to. □□

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